1.0 INTRODUCTION

This Environmental Assessment (EA) provides the results of an evaluation by the U.S. Department of Energy (DOE) of the potential environmental consequences from installation and operation of an advanced hybrid particulate collection (AHPC) system at Otter Tail Power Company's 450-megawatt, coal-fired, Big Stone Power Plant near Big Stone City, South Dakota. DOE is proposing (the Proposed Action) to provide cost-shared financial support, through a cooperative agreement with Otter Tail Power Company, to install and operate an AHPC system for demonstrating the technical, environmental, and economic performance of AHPC technology. If approved, DOE would provide 49% of the estimated $13.4 million cost for the project.

The purpose of the EA is to determine if the Proposed Action could potentially cause significant impacts to the environment. If potentially significant, adverse environmental impacts are identified, and if they cannot be reduced to insignificance or avoided, then a more detailed Environmental Impact Statement would be prepared. If no significant impacts are identified, a Finding of No Significant Impact would be prepared and made available to the public, along with the final EA, before DOE proceeds with the Proposed Action.

Otter Tail Power Company proposed the project, entitled "Demonstration of a Full-Scale Retrofit of the Advanced Hybrid Particulate Collector," to DOE in response to competitive solicitation DE-PS26-01NT41104, the "Power Plant Improvement Initiative." Otter Tail Power and its partners, Montana-Dakota Utilities and NorthWestern Public Service, proposed to retrofit AHPC technology into an existing electrostatic precipitator (ESP) at the Big Stone Power Plant; this application was selected for negotiations leading to award of a cooperative agreement with specific objectives to demonstrate ultra-low fine particulate emissions, low pressure drop, overall reliability of the technology, and long-term bag life.

AHPC technology provides a new approach to particulate collection. The technology, which was tested at a smaller scale under funding from the DOE, combines the best features of electrostatic precipitators and baghouses in a novel manner. The AHPC concept integrates fabric filtration and electrostatic precipitation into one particulate collection device, providing synergism in the particulate collection step and in transfer and handling of collected particles. An AHPC system provides ultra-high collection efficiency, overcomes problems of excessive fine-particle emissions with conventional ESPs, and solves problems of re-entrainment and re-collection of dust in conventional baghouses.

AHPC technology has been tested on a small stream of flue gas at the Big Stone Power Plant for the past 1½ years. The potential to achieve collection efficiencies exceeding 99.99% by one to two orders of magnitude was verified over a range of particle sizes from 0.01 to 50 microns. The resulting flue gas was as clean as pristine ambient air with a fine particulate matter level of 5 micrograms per cubic meter ($\mu g/m^3$), which would be below current particulate emission standards. Preliminary economic analysis indicates that AHPC is economically competitive with conventional ESPs and baghouses for meeting current standards; for meeting possible stricter fine-particle standards requiring, for example, 99.99% control of total particulate, AHPC is the economic choice over either ESPs or baghouses by a wide margin.

AHPC systems, which combine high particulate collection efficiency with a small footprint and potential economic advantages, would provide superior technology for new or existing plants. Due to the age and efficiency of many existing ESPs, a substantial need for this type of retrofit technology exists.

This study was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969

(42 United States Code 4321 *et seq.*), the Council on Environmental Quality's Regulations [Title 40, Code of Federal Regulations (CFR), Parts 1500-1508], and Department of Energy's NEPA Implementing Procedures (Title 10, CFR, Part 1021).